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dition of much of the level upland plains of populous China, where now exist soil areas hundreds of square miles in extent that are absolutely depopulated, the restoration of which has been called "The Problem of China."

Permanent agriculture is the only structure upon which the future prosperity of the American nation can be secured, and the absolutely essential foundation of permanent agriculture is the fertility of the soil.

CYRIL G. HOPKINS

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*EXTRACTS FROM PRESIDENT ROOSEVELT'S
MESSAGE TO THE CONGRESS*

IF there is any one duty which more than another we owe it to our children and our children's children to perform at once, it is to save the forests of this country, for they constitute the first and most important element in the conservation of the natural resources of the country. There are, of course, two kinds of natural resources. One is the kind which can only be used as part of a process of exhaustion; this is true of mines, natural oil and gas wells and the like. The other, and of course ultimately by far the most important, includes the resources which can be improved in the process of wise use; the soil, the rivers and the forests come under this head. Any really civilized nation will so use all of these three great national assets that the nation will have their benefit in the future.

Just as a farmer, after all his life making his living from his farm, will, if he is an expert farmer, leave it as an asset of increased value to his son, so we should leave our national domain to our children, increased in value and not worn out. There are small sections of our own country, in the east and in the west, in the Adirondacks, the White Mountains and the Ap-

palachians, and in the Rocky Mountains, where we can already see for ourselves the damage in the shape of permanent injury to the soil and the river systems which comes from reckless deforestation. It matters not whether this deforestation is due to the actual reckless cutting of timber, to the fires that inevitably follow such reckless cutting of timber or to reckless and uncontrolled grazing, especially by the great migratory bands of sheep, the unchecked wandering of which over the country means destruction to forests and disaster to the small homemakers, the settlers of limited means.

Shortsighted persons, or persons blinded to the future by desire to make money in every way out of the present, sometimes speak as if no great damage would be done by the reckless destruction of our forests. It is difficult to have patience with the arguments of these persons. Thanks to our own recklessness in the use of our splendid forests, we have already crossed the verge of a timber famine in this country, and no measures that we now take can, at least for many years, undo the mischief that has already been done. But we can prevent further mischief being done, and it would be in the highest degree reprehensible to let any consideration of temporary convenience or temporary cost interfere with such action, especially as regards the national forests which the nation can now, at this very moment, control.

All serious students of the question are aware of the great damage that has been done in the Mediterranean countries of Europe, Asia and Africa by deforestation. The similar damage that has been done in eastern Asia is less well known. A recent investigation into conditions in North China by Mr. Frank N. Meyer, of the Bureau of Plant Industry of the United States Department of Agriculture, has incidentally

furnished in very striking fashion proof of the ruin that comes from reckless deforestation of mountains, and of the further fact that the damage once done may prove practically irreparable.

So important are these investigations that I herewith attach as an appendix to my message certain photographs showing present conditions in China. They show in vivid fashion the appalling desolation, taking the shape of barren mountains and gravel and sand covered plains, which immediately follows and depends upon the deforestation of the mountains. Not many centuries ago the country of northern China was one of the most fertile and beautiful spots in the entire world and was heavily forested.

We know this not only from the old Chinese records, but from the accounts given by the traveler Marco Polo. He, for instance, mentions that in visiting the provinces of Shansi and Shensi he observed many plantations of mulberry trees. Now there is hardly a single mulberry tree in either of these provinces, and the culture of the silkworm has moved further south, to regions of atmospheric moisture. As an illustration of the complete change in the rivers, we may take Polo's statement that a certain river, the Hun Ho, was so large and deep that merchants ascended it from the sea with heavily laden boats; to-day this river is simply a broad sandy bed, with shallow, rapid currents wandering hither and thither across it, absolutely unnavigable.

But we do not have to depend upon written records. The dry wells, and the wells with water far below the former water mark, bear testimony to the good days of the past and the evil days of the present. Wherever the native vegetation has been allowed to remain, as, for instance, here and there around a sacred temple or im-

perial burying ground, there are still huge trees and tangled jungle, fragments of the glorious ancient forests. The thick, matted forest growth formerly covered the mountains to their summits. All natural factors favored this dense forest growth, and as long as it was permitted to exist the plains at the foot of the mountains were among the most fertile on the globe, and the whole country was a garden.

Not the slightest effort was made, however, to prevent the unchecked cutting of the trees or to secure reforestation. Doubtless for many centuries the tree-cutting by the inhabitants of the mountains worked but slowly in bringing about the changes that have now come to pass; doubtless for generations the inroads were scarcely noticeable. But there came a time when the forest had shrunk sufficiently to make each year's cutting a serious matter, and from that time on the destruction proceeded with appalling rapidity; for, of course, each year of destruction rendered the forest less able to recuperate, less able to resist next year's inroad.

Mr. Meyer describes the ceaseless progress of the destruction even now, when there is so little left to destroy. Every morning men and boys go out armed with mattocks or axes, scale the steepest mountain sides, and cut down and grub out, root and branch, the small trees and shrubs still to be found. The big trees disappeared centuries ago, so that now one of these is never seen save in the neighborhood of temples, where they are artificially protected; and even here it takes all the watch and care of the tree-loving priests to prevent their destruction.

Each family, each community, where there is no common care exercised in the interest of all of them to prevent deforestation, finds its profit in the immediate use of the fuel which would otherwise be used by

some other family or some other community. In the total absence of regulation of the matter in the interest of the whole people, each small group is inevitably pushed into a policy of destruction which can not afford to take thought for the morrow. This is just one of those matters which it is fatal to leave to unsupervised individual control. The forests can only be protected by the state, by the nation; and the liberty of action of individuals must be conditioned upon what the state or nation determines to be necessary for the common safety.

The lesson of deforestation in China is a lesson which mankind should have learned many times already from what has occurred in other places. Denudation leaves naked soil; then gulying cuts down to the bare rock; and meanwhile the rock waste buries the bottom lands. When the soil is gone, men must go; and the process does not take long.

This ruthless destruction of the forests in northern China has brought about, or has aided in bringing about, desolation, just as the destruction of the forests in central Asia aid in bringing ruin to the once rich central Asian cities; just as the destruction of the forests in northern Africa helped toward the ruin of a region that was a fertile granary in Roman days. Short-sighted man, whether barbaric, semi-civilized, or what he mistakenly regards as fully civilized, when he has destroyed the forests, has rendered certain the ultimate destruction of the land itself.

In northern China the mountains are now such as are shown by the accompanying photographs, absolutely barren peaks. Not only have the forests been destroyed, but because of their destruction the soil has been washed off the naked rock. The terrible consequence is that it is impossible now to undo the damage that has been done.

Many centuries would have to pass before soil would again collect, or could be made to collect, in sufficient quantity once more to support the old-time forest growth. In consequence the Mongol Desert is practically extending eastward over northern China. The climate has changed and is still changing. It has changed even within the last half century, as the work of tree destruction has been consummated.

The great masses of arboreal vegetation on the mountains formerly absorbed the heat of the sun and sent up currents of cool air which brought the moisture-laden clouds lower and forced them to precipitate in rain a part of their burden of water. Now that there is no vegetation, the barren mountains, scorched by the sun, send up currents of heated air which drive away instead of attracting the rain clouds, and cause their moisture to be disseminated. In consequence, instead of the regular and plentiful rains which existed in these regions of China when the forests were still in evidence, the unfortunate inhabitants of the deforested lands now see their crops wither for lack of rainfall, while the seasons grow more and more irregular; and as the air becomes dryer certain crops refuse longer to grow at all.

That everything dries out faster than formerly is shown by the fact that the level of the wells all over the land has sunk perceptibly, many of them having become totally dry. In addition to the resulting agricultural distress, the watercourses have changed. Formerly they were narrow and deep, with an abundance of clear water the year around; for the roots and humus of the forests caught the rain-water and let it escape by slow, regular seepage. They have now become broad, shallow stream beds, in which muddy water trickles in slender currents during the dry seasons, while when it rains there are freshets, and

roaring muddy torrents come tearing down, bringing disaster and destruction everywhere.

Moreover, these floods and freshets, which diversify the general dryness, wash away from the mountain sides, and either wash away or cover in the valleys, the rich fertile soil which it took tens of thousands of years for nature to form; and it is lost forever, and until the forests grow again it can not be replaced. The sand and stones from the mountain sides are washed loose and come rolling down to cover the arable lands, and in consequence, throughout this part of China, many formerly rich districts are now sandy wastes, useless for human cultivation and even for pasture. The cities have been, of course, seriously affected, for the streams have gradually ceased to be navigable. There is testimony that even within the memory of men now living there has been a serious diminution of the rainfall in northeastern China. The level of the Sungari River, in northern Manchuria, has been sensibly lowered during the last fifty years, at least partly as the result of indiscriminate cutting of the forests forming its watershed. Almost all the rivers of northern China have become uncontrollable, and very dangerous to the dwellers along their banks, as a direct result of the destruction of the forests. The journey from Peking to Jehol shows in melancholy fashion how the soil has been washed away from whole valleys, so that they have been converted into deserts.

In northern China this disastrous process has gone on so long and has proceeded so far that no complete remedy could be applied. There are certain mountains in China from which the soil is gone so utterly that only the slow action of the ages could again restore it, although of course much could be done to prevent the still further eastward extension of the

Mongolian Desert if the Chinese government would act at once. The accompanying cuts from photographs show the inconceivable desolation of the barren mountains in which certain of these rivers rise—mountains, be it remembered, which formerly supported dense forests of larches and firs, now unable to produce any wood, and because of their condition a source of danger to the whole country.

The photographs also show the same rivers after they have passed through the mountains, the beds having become broad and sandy because of the deforestation of the mountains. One of the photographs shows a caravan passing through a valley. Formerly, when the mountains were forested, it was thickly peopled by prosperous peasants. Now the floods have carried destruction all over the land and the valley is a stony desert. Another photograph shows a mountain road covered with the stones and rocks that are brought down in the rainy season from the mountains, which have already been deforested by human hands. Another shows a pebbly river bed in southern Manchuria, where what was once a great stream has dried up owing to the deforestation in the mountains. Only some scrubwood is left, which will disappear within a half century. Yet another shows the effect of one of the washouts, destroying an arable mountain side, these washouts being due to the removal of all vegetation; yet in this photograph the foreground shows that reforestation is still a possibility in places.

What has thus happened in northern China, what has happened in central Asia, in Palestine, in north Africa, in parts of the Mediterranean countries of Europe, will surely happen to our country if we do not exercise that wise forethought which should be one of the chief marks of any people calling itself civilized. Nothing should be permitted to stand in the way of

the preservation of the forests, and it is criminal to permit individuals to purchase a little gain for themselves through the destruction of forests when this destruction is fatal to the well-being of the whole country in the future.

Action should be begun forthwith, during the present session of the congress, for the improvement of our inland waterways—action which will result in giving us not only navigable but navigated rivers. We have spent hundreds of millions of dollars upon these waterways, yet the traffic on nearly all of them is steadily declining. This condition is the direct result of the absence of any comprehensive and far-seeing plan of waterway improvement. Obviously we can not continue thus to expend the revenues of the government without return. It is poor business to spend money for inland navigation unless we get it.

Inquiry into the condition of the Mississippi and its principal tributaries reveals very many instances of the utter waste caused by the methods which have hitherto obtained for the so-called "improvement" of navigation. A striking instance is supplied by the "improvement" of the Ohio, which, begun in 1824, was continued under a single plan for half a century. In 1875 a new plan was adopted and followed for a quarter of a century. In 1902 still a different plan was adopted and has since been pursued at a rate which only promises a navigable river in from twenty to one hundred years longer.

Such short-sighted, vacillating, and futile methods are accompanied by decreasing water-borne commerce and increasing traffic congestion on land, by increasing floods, and by the waste of public money. The remedy lies in abandoning the methods which have so signally failed and adopting new ones in keeping with the needs and demands of our people.

In a report on a measure introduced at the first session of the present congress, the secretary of war said: "The chief defect in the methods hitherto pursued lies in the absence of executive authority for originating comprehensive plans covering the country or natural divisions thereof." In this opinion I heartily concur. The present methods not only fail to give us inland navigation, but they are injurious to the army as well. What is virtually a permanent detail of the corps of engineers to civilian duty necessarily impairs the efficiency of our military establishment.

The military engineers have undoubtedly done efficient work in actual construction, but they are necessarily unsuited by their training and traditions to take the broad view, and to gather and transmit to the congress the commercial and industrial information and forecasts, upon which waterway improvement must always so largely rest. Furthermore, they have failed to grasp the great underlying fact that every stream is a unit from its source to its mouth, and that all its uses are interdependent.

Prominent officers of the engineer corps have recently even gone so far as to assert in print that waterways are not dependent upon the conservation of the forests about their headwaters. This position is opposed to all the recent work of the scientific bureaus of the government and to the general experience of mankind. A physician who disbelieved in vaccination would not be the right man to handle an epidemic of smallpox, nor should we leave a doctor sceptical about the transmission of yellow fever by the *Stegomyia* mosquito in charge of sanitation at Havana or Panama. So with the improvement of our rivers; it is no longer wise or safe to leave this great work in the hands of men who fail to grasp the essential relations between navigation and general development and to assimilate

and use the central facts about our streams.

Until the work of river improvement is undertaken in a modern way it can not have results that will meet the needs of this modern nation. These needs should be met without further dilly-dallying or delay. The plan which promises the best and quickest results is that of a permanent commission authorized to coordinate the work of all the government departments relating to waterways, and to frame and supervise the execution of a comprehensive plan. Under such a commission the actual work of construction might be intrusted to the reclamation service or to the military engineers, acting with a sufficient number of civilians to continue the work in time of war; or it might be divided between the reclamation service and the corps of engineers. Funds should be provided from current revenues, if it is deemed wise—otherwise from the sale of bonds. The essential thing is that the work should go forward under the best possible plan and with the least possible delay. We should have a new type of work and a new organization for planning and directing it. The time for playing with our waterways is past. The country demands results.

I urge that all our national parks adjacent to national forests be placed completely under the control of the forest service of the agricultural department, instead of leaving them as they now are, under the interior department and policed by the army. The congress should provide for superintendents, with adequate corps of first-class civilian scouts, or rangers, and, further, place the road construction under the superintendent instead of leaving it with the war department. Such a change in park management would result in economy and avoid the difficulties of administration which now arise from having the responsibility of care and protection di-

vided between different departments. The need for this course is peculiarly great in the Yellowstone Park. This, like the Yosemite, is a great wonderland, and should be kept as a national playground. In both all wild things should be protected and the scenery kept wholly unmarred.

I am happy to say that I have been able to set aside in various parts of the country small, well-chosen tracts of ground to serve as sanctuaries and nurseries for wild creatures.

I had occasion in my message of May 4, 1906, to urge the passage of some law putting alcohol, used in the arts, industries, and manufactures, upon the free list; that is, to provide for the withdrawal free of tax of alcohol which is to be denatured for those purposes. The law of June 7, 1906, and its amendment of March 2, 1907, accomplished what was desired in that respect, and the use of denatured alcohol, as intended, is making a fair degree of progress and is entitled to further encouragement and support from the congress.

The pure-food legislation has already worked a benefit difficult to overestimate.

The share that the national government should take in the broad work of education has not received the attention and the care it rightly deserves. The immediate responsibility for the support and improvement of our educational systems and institutions rests and should always rest with the people of the several states acting through their state and local governments, but the nation has an opportunity in educational work which must not be lost and a duty which should no longer be neglected.

The National Bureau of Education was established more than forty years ago. Its purpose is to collect and diffuse such information "as shall aid the people of the United States in the establishment and

maintenance of efficient school systems and otherwise promote the cause of education throughout the country." This purpose in no way conflicts with the educational work of the states, but may be made of great advantage to the states by giving them the fullest, most accurate, and hence the most helpful information and suggestion regarding the best educational systems. The nation, through its broader field of activities, its wider opportunity for obtaining information from all the states and from foreign countries, is able to do that which not even the richest states can do, and with the distinct additional advantage that the information thus obtained is used for the immediate benefit of all our people.

With the limited means hitherto provided the Bureau of Education has rendered efficient service, but the congress has neglected to adequately supply the bureau with means to meet the educational growth of the country. The appropriations for the general work of the bureau, outside education in Alaska, for the year 1909 are but \$87,500—an amount less than they were ten years ago, and some of the important items in these appropriations are less than they were thirty years ago. It is an inexcusable waste of public money to appropriate an amount which is so inadequate as to make it impossible properly to do the work authorized, and it is unfair to the great educational interests of the country to deprive them of the value of the results which can be obtained by proper appropriations.

I earnestly recommend that this unfortunate state of affairs as regards the national education office be remedied by adequate appropriations. This recommendation is urged by the representatives of our common schools and great state universities and the leading educators, who all unite in requesting favorable consideration

and action by the congress upon this subject.

I strongly urge that the request of the director of the census in connection with the decennial work so soon to be begun, be complied with, and that the appointments to the census force be placed under the civil-service law, waiving the geographical requirements as requested by the director of the census. The supervisors and enumerators should not be appointed under the civil-service law, for the reasons given by the director. I commend to the congress the careful consideration of the admirable report of the director of the census, and I trust that his recommendations will be adopted and immediate action thereon taken.

It is highly advisable that there should be intelligent action on the part of the nation on the question of preserving the health of the country. Through the practical extermination in San Francisco of disease-bearing rodents our country has thus far escaped the bubonic plague. This is but one of the many achievements of American health officers; and it shows what can be accomplished with a better organization than at present exists. The dangers to public health from food adulteration and from many other sources, such as the menace to the physical, mental and moral development of children from child labor, should be met and overcome. There are numerous diseases, which are now known to be preventable, which are, nevertheless, not prevented. The recent International Congress on Tuberculosis has made us painfully aware of the inadequacy of American public health legislation.

This nation can not afford to lag behind in the world-wide battle now being waged by all civilized people with the microscopic foes of mankind, nor ought we longer to ignore the reproach that this government takes more pains to protect the lives of

hogs and of cattle than of human beings. The first legislative step to be taken is that for the concentration of the proper bureaus into one of the existing departments. I therefore urgently recommend the passage of a bill which shall authorize a redistribution of the bureaus which shall best accomplish this end.

WOLCOTT GIBBS

DR. OLIVER WOLCOTT GIBBS, from 1863 to 1887 Rumford professor of applied science and later emeritus professor in Harvard University, past president of the National Academy of Sciences and of the American Association for the Advancement of Science, died at his home in Newport, R. I., on December 9, in his eighty-seventh year. We hope to print later an adequate appreciation of Professor Gibbs's contributions to chemistry. A biographical note, prepared by him about two years ago and given to his nephew, Dr. Alfred Tuckermann, with the request that it be published after his death, is as follows:

Oliver Wolcott Gibbs was born in New York, February 21, 1822. He was the second son of George and Laura Wolcott Gibbs and grandson of Oliver Wolcott, secretary of the treasury during part of the presidency of Washington and of John Adams. His father, Colonel George Gibbs, owned a large estate on Long Island known as Sunswick, a few miles from the then small city of New York. He was one of the earliest American mineralogists, devoted to that branch of science, and an active and successful horticulturist. Wolcott, like his elder brother, inherited his father's tastes: He was often occupied with making volcanoes with such materials as he could obtain and in searching the stone walls on the estate for minerals, and the gardens and fields for flowers. His mother was an artist of no mean ability, and often won the praises of Gilbert Stuart by her work. At the age of seven, Wolcott went to reside in Boston with his aunt, Miss Sarah Gibbs, who, at that time, with her brother-in-law, Dr. Channing, and her sister, occupied a fine mansion in Mount Vernon Street during the early spring and

winter months. The boy was sent to a school kept by Mr. Leverett, a prominent Latin scholar. Among his fellow pupils were William M. Evarts, the two brothers Perkins, Greenough, Samuel Eliot and others who in time became distinguished. Miss Gibbs and the Channings spent the summers and autumns at Oakland, a large estate about five miles from Newport, Rhode Island, which, under their care, became, as it still is, very attractive. The summer home was a most hospitable one and Dr. Channing's fame brought many foreign visitors. When about twelve years of age, Wolcott, whose father had died in 1833 at Sunswick, was sent to a celebrated school at Flushing, Long Island, kept by the Rev. Dr. Muhlenberg. He was two years at this school of which he entertained always an affectionate remembrance. In 1835 the estate at Sunswick was sold and the family moved to New York. Wolcott was sent to the grammar school of Columbia College and in 1837 he entered Columbia College as a freshman.

In 1841 he graduated and later became assistant to Dr. Robert Hare who held the chair of chemistry in the medical school of the University of Pennsylvania. After some months in the laboratory, Wolcott commenced the study of medicine with the view of qualifying himself to hold the chair of chemistry in a medical school. After two years of study at the College of Physicians and Surgeons in New York, he received the degree of Doctor of Medicine in 1845, and shortly after sailed for Hamburg. He took up his residence in Berlin and entered, as a student, the laboratory of Professor Carl Rammelsberg. After some months with him, he entered the laboratory of Heinrich Rose, where he remained about a year. He then went to Giessen where he spent one semester with Liebig. Thence to Paris, where he attended lectures by Laurent and Dumas, and especially by Regnault. He returned to New York in the fall of 1848, having received from the College of Physicians and Surgeons an offer of an assistant professorship of chemistry, Dr. John Torrey being full professor. In 1849 he was elected professor of chemistry and